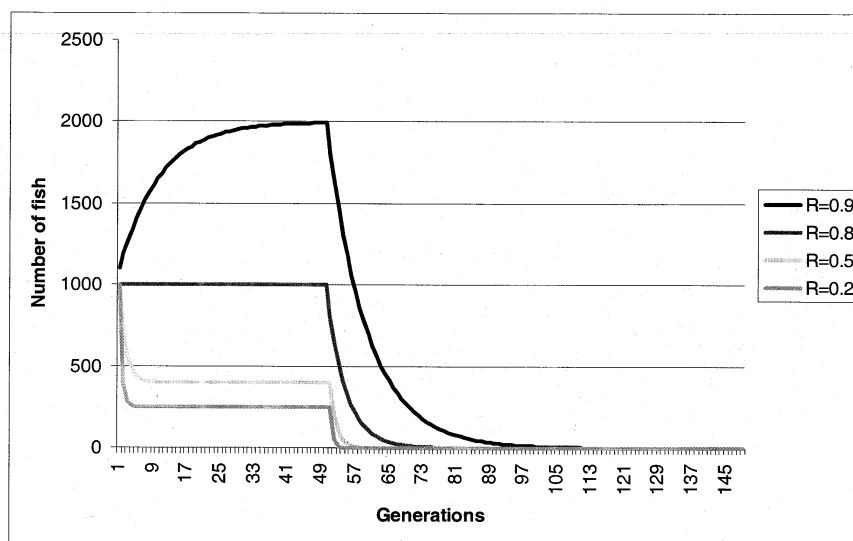


Summary of Michelle McClure's presentation:

Masking population status: an exploration of a simple model

Issue: hatchery strays can make a system appear to be self-sustaining when it is not.



Initial population size: 1000

200 hatchery strays per generation, until generation 50

0 hatchery strays after generation 50

Masked populations can appear to be:

- stable
- declining
- increasing

Declines due to:

- overharvest
- habitat degradation
- negative effects of hatchery releases
- other factors

may be masked.

Willamette River chinook and steelhead populations

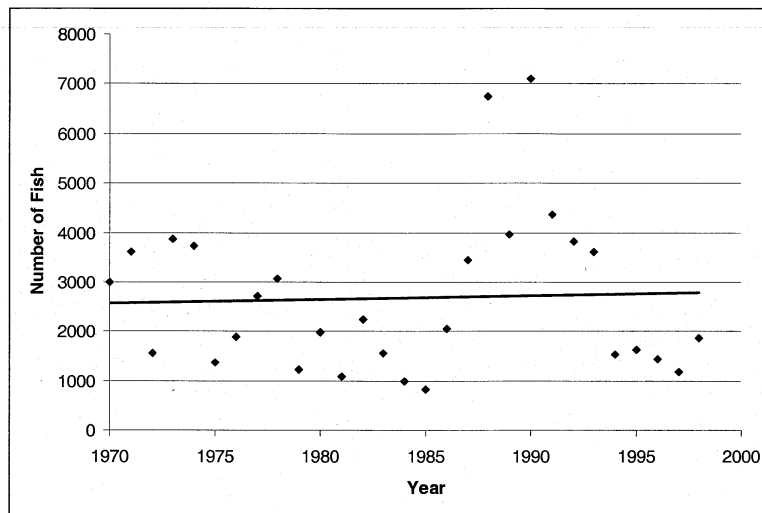
- large hatchery influence
- substantial habitat loss and degradation
- sizeable harvest

1. Estimate replacement rate (R) and "quasi-extinction" risk of the population, including natural spawners of hatchery origin.
2. Estimate minimum replacement rate, without natural spawners of hatchery origin.
3. Estimate "quasi-extinction" risk with minimum replacement rate.

Naturally spawning McKenzie River spring Chinook salmon (above Leaburg dam,)

1970-1998 natural spawners

ODFW estimates of proportion of hatchery spawners in 1994-1998



With natural spawners of hatchery origin,

$$R = 1.09 (0.91 - 1.30)$$

Quasi-extinction risk:

| | |
|-------------|--|
| In 10 yrs: | 2×10^{-7} (0.003-1.2x10 ⁻¹¹) |
| In 100 yrs: | 0.15 (0.99-0.0002) |

BUT:

Replacement rate may be as low as

Apparent R - % spawners of hatchery origin

$$= 1.09 - 0.23 = 0.86$$

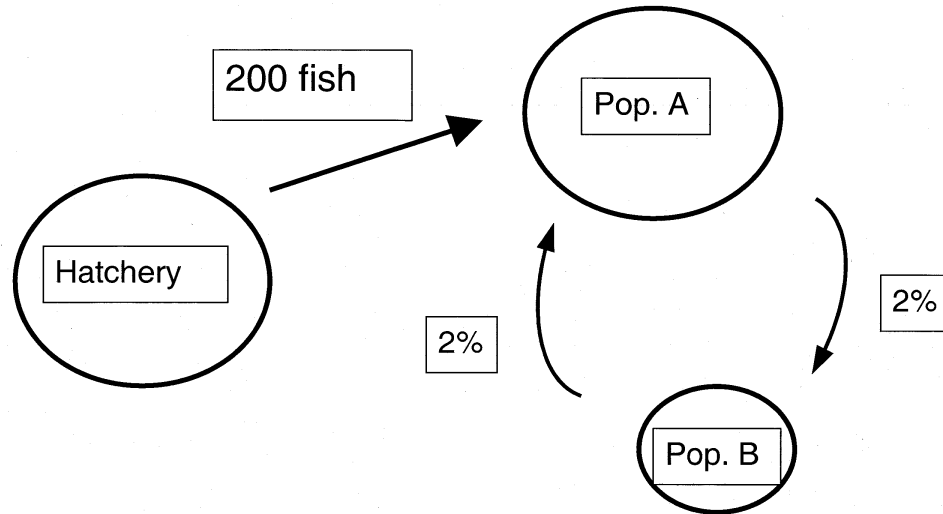
Quasi-extinction risk falls in the following range:

| | Maximum R | Minimum R |
|---------|--|--|
| 10 yrs | 2×10^{-7} (0.003-1.2x10 ⁻¹¹) | 0.0003 (0.07-1.7x10 ⁻⁶) |
| 25 yrs | 0.001 (0.54-1.6x10 ⁻⁶) | 0.369 (0.92-0.02) |
| 100 yrs | 0.15 (0.99-0.0002) | 0.999 (1-3.2x10 ⁻⁵) |

Cannot tell with available data.

It gets worse.

Populations with no apparent spawners of hatchery origin can still be dependent on supplementation.



Size of population A influenced by:

- migration rate
- replacement rate
- number of hatchery fish naturally spawning

Size of population B influenced by:

- migration rate
- replacement rate
- size of population A

Most likely in populations

- with low abundance
- some distance from the hatchery

Calapooia River Steelhead

- low abundance (mean over the last 5 years = 114)
- some distance from N. Santiam R. hatchery
- few spawners of hatchery origin

Apparent $R = 1.06$ (0.79-1.43)

Quasi-extinction risk:

In 10 yrs 0.02
(0.12 - 2×10^{-6})

In 100 yrs 0.90
(0.99-0.001)

Given:

- proportion of hatchery spawners in N. Santiam River (~15%)
- estimated stray rate (2%)
- current replacement rate of N. Santiam stock (~0.96)

Replacement rate for the Calapooia population may be as low as 0.54

Quasi-extinction risk range:

| | Maximum R | Minimum R |
|---------|--|---------------------|
| 10 yrs | 0.02 (0.12- 2.1×10^{-6}) | 0.96 (0.99-0.09) |
| 25 yrs | 0.00092 (0.83- 1.6×10^{-7}) | 1 (1-0.67) |
| 100 yrs | 0.90 (0.99-0.001) | 1 |

Monitoring is a critical component of any supplementation program.

Important elements of a monitoring program:

1. Number of natural spawners of hatchery origin.
2. Stage-specific productivity (e.g. natural smolt production)
3. Measures of factors that might lead to decline (e.g. habitat quality, harvest rates)